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Barriers to ART initiation for HIV-positive children 2-18 months in Swaziland

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Abstract

Background: Although early antiretroviral therapy (ART) reduces HIV-related mortality in children by up to 75%, almost half of HIV-positive children <1 year old in Swaziland do not initiate ART. This study was conducted to identify barriers to early ART initiation among HIV-positive infants.

Methods: This was a case-control study among HIV-positive infants, aged 2 to 18 months, who either did not initiate ART (cases), or initiated ART (controls), during 18-months after testing.

Results: Multivariable logistic regression showed that infants who visited the clinic every month, or every 2 months, were 5.78 and 6.20 times more likely to initiate ART compared to those who visited less often (OR 5.78, 95% CI 1.82-18.33 and OR 6.20, 95% CI 1.30–29.60, respectively). Children who lived 30 and 31-60 minutes from the nearest clinic were 84% and 79% less likely, respectively, to initiate ART (OR 0.16, 95% CI 0.03-0.78 and OR 0.21, 95% CI 0.04-0.98) compared with those who lived >60 minutes. Children who received immunization after 6 months were 22.59 times more likely to initiate ART (OR 22.59, 95% CI 7.00-21.72) than those who did not. Infants of caregivers who had excellent or good relationship with their healthcare provider were 4.32 times more likely to initiate ART (OR 4.32, 95% CI 1.01-18.59) than those of caregivers who had average or poor relationship with healthcare providers.

Conclusion: The significant predictors of ART initiation identified in this study should be regarded as priority areas for intervention among HIV-positive women in Swaziland.

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Conflict of interests

The authors have no conflict of interests to declare.

Keywords

Barriers; HIV; ART initiation; Swaziland; HIV-positive infants

Introduction

Approximately 3.3 million cases of human immunodeficiency virus (HIV) infection were reported worldwide in children under the age of 15 years in 2013, and 2.9 million of these cases were from sub-Saharan Africa (SSA) alone (Joint United Nations Programme on HIV/AIDS, 2013b). Swaziland is the country with the highest HIV prevalence (26% among 15-49 year olds) in the world (Joint United Nations Programme on HIV/AIDS, 2010). In Swaziland 42% of pregnant women are HIV-positive and their average live-birth rate is 3.7 creating a risk for the numbers of HIV infected infants to continue to increase (Joint United Nations Programme on HIV/AIDS, 2010; Whiteside & Henry, 2011). During the past decade, HIV/AIDS has remained the leading cause of death among children under 5 years in Swaziland (World Health Organization, n.d.). Although 85-90% of HIV-positive pregnant women enroll in prevention of mother-to-child transmission (pMTCT) program in the country and there is reduced HIV positivity to about 2.3% among infants tested at 6-8 weeks through DNA PCR during 2011-2013 compared to 5% in 2010 (United Nations Children's Fund, 2013; Joint United Nations Programme on HIV/AIDS, 2014), there is a big challenge for infants who test HIV-positive to be enrolled into care and treatment by their mothers/ caretakers.

In 2010, the number of newly infected infants <12 months in Swaziland was 1,335 representing 4% of the world's newly infected infants (Joint United Nations Programme on HIV/AIDS, 2010; Sibbald, 2012). Eighty percent of infants who become infected with HIV will progress rapidly with the disease (Newell et al., 2004; Central Statistical Office). Without early care and antiretroviral therapy (ART) initiation, more than a third of HIV-infected children will die before their first birthday, and more than half will die by the age of two years (Newell, Brahmbhatt, & Ghys 2004; Ministry of Health and Social Welfare, 2010). The Children with HIV Early Antiretroviral Therapy (CHER) study in South Africa has demonstrated that early ART reduces HIV-related mortality by as much as 75% (Violari, 2008). Hence, it is extremely important to ensure that HIV-infected infants receive ART within at least 2 months of their diagnosis. The 2010 Swaziland Paediatric HIV Management Guidelines recommended that all children less than 24 months who are confirmed HIV-positive be initiated on ART regardless of their immunological or clinical stage (Ministry of Health and Social Welfare, 2010). However, the goals for infant outcome and ART enrollment in Swaziland have not been reached. In 2012, almost half of HIV-positive children under one year who were eligible for ART had not initiated treatment (Kabue et al., 2012; Joint United Nations Programme on HIV/AIDS, 2013a).

Several studies have reported on facilitators and barriers to initiation of HIV-positive infants 2 years on ART in SSA (Table 1). Two studies from South Africa reported on personal and institutional factors that were barriers to ART uptake. Personal factors included lack of disclosure of HIV status for mother and child due to maternal guilt, secrecy and need to

avoid stigma and discrimination, lack of money for transportation, food availability, time constraints due to work commitment, religious beliefs and lack of coordination amongst multiple caregivers (Kimani-Murage et al., 2013; Yeap et al., 2010). Institutional factors included long queues at the health facilities, negative staff attitudes, missed testing opportunities at healthcare facilities and provider difficulties with pediatric counselling and venesection. Caregivers' perception that the child is healthy and misconceptions regarding the course of HIV disease in children were also barriers to initiating the children on ART. Facilitators to ART initiation that were identified by the studies included help with transport, support from family and day care centers, and seeing children's health improve on treatment. A study conducted in Kenya by Wachira et al. (2012), found factors similar to those reported by South Africa such as transportation costs, food availability, time constraints due to work commitment, disclosure of HIV status for mother and child, perception that child is healthy and religious beliefs as barriers affecting ART initiation among infants. A West African study conducted in the Ivory Coast and Burkina Faso found that the main reasons of not including children into care were fear of fathers' refusal (48%), mortality (24%), false-positive HIV infection test (16%) and other ineligibility reasons (12%). Previous disclosure of the child's and the mother's HIV status to the father, and the child being older than 12 months were related to early ART (EART) initiation (Dahourou et al., 2016). In our qualitative study conducted in Swaziland we found that denial, guilt, lack of knowledge, tuberculosis (TB)/HIV co-infection, HIV-related stigma, lack of money, and distance to clinics were barriers to infant ART initiation (Ahmed et al. 2017). ?treatments for opportunistic infections?

This quantitative study was designed simultaneously with the qualitative study to identify barriers to initiating children (aged 2-18 months) on ART upon diagnosis of HIV by HIV DNA PCR between January 2011 and December 2012. The findings from this study can be used to improve HIV service delivery strategies for pediatric ART enrollment.

Methods

Study design, inclusion and exclusion criteria

This study was designed as a retrospective case-control study. Cases were defined as infants, aged 2 to 18 months, who received a positive DNA HIV PCR test in the period of January 2011 through December 2012 and who were not documented to have initiated ART through June 2014. Controls were infants 2-18 months who tested HIV PCR positive during the same period and who were documented to have initiated ART. Based on the study on factors associated with nevirapine (NVP) intake among pregnant women and newborn infants in Tanzania and Uganda by Kracher et al., 2006, which found that maternal education was associated with NVP uptake by infants we hypothesized that HIV-positive infants diagnosed by HIV DNA PCR between 6-10 weeks postpartum and delivered to women with at least 6 years of formal education would be at least 1.8 times as likely to uptake ART by 12 weeks of age as those born to women with less than 6 years education. At a ratio of 1 case to 2 controls a total of 210 participants (70 cases and 140 controls) would provide 80% power to detect a difference of 20% in ART uptake rates between the groups assuming 2-sided confidence level of 95%. The Institutional Review Board (IRB) of the University of

Alabama at Birmingham and the Swaziland Scientific and Ethics Committee reviewed and approved the study protocol before its implementation.

Sampling method

A record review was carried out at 11 preselected health facilities representing all four regions of Swaziland (Hhohho, Manzini, Lubombo, and Shiselweni) to identify eligible participants for the study. These facilities were chosen based on the high number of HIV DNA PCR tests that were conducted in their clinic during January 2011 and December 2012 and represented 76% of all positive DNA PCR test results in the country during the time period. The facilities were: Baylor Clinical Centre of Excellence (COE) Headquarters in Mbabane, Raleigh Fitkin Memorial (RFM) Hospital Baylor Satellite Clinic, Hlatikulu Baylor Satellite Clinic, Good Shepherd Mission Hospital, King Sobhuza II (KS II) PHU, Matsapha MSF Clinic, Nhlangano PHU, Luyengo Clinic, Lobamba Clinic, Siphofaneni Clinic, and Horo Clinic. A first list of potential participants was extracted from the national HIV DNA PCR database. Then, at each facility, the clinic databases were reviewed to confirm and identify eligible infants and locate their records detailing HIV DNA PCR test dates, test result distribution dates, ART enrollment status, and parent/caretaker information.

All infants who met our eligibility criteria were followed-up for enrollment in the study. Infants who were lost to follow-up by the facility and did not initiate ART were traced. First, discussions were conducted with health care workers (primarily senior nurses and doctors) to determine the overall outcome of the child. From the 11 sites, patient data and caregiver contact information were extracted for 610 HIV-positive children that met the inclusion criteria. Trained local Swaziland data collectors then called mothers/caregivers of both cases and controls to tell them about the study and ask them if they would participate. For caregivers not reached on the first attempt, four additional attempts were made at varying times of day or on the following day. If after the fifth attempt the caregiver could not be reached, she was considered “not available”. If the caregiver declined, if the contact number from the facility was incorrect (i.e., never heard of primary caregiver or child), or if the contact number was no longer in service, no further attempts were made to contact the caregiver. More than 20% of the caregivers did not have a phone number available in the facility files, and the number was wrong for more than 20% (either incorrect in the clinic register, or inactive for >6 months). No caregivers were successfully enrolled from Siphofanini clinic; therefore, all infants were enrolled from the remaining 10 facilities.

An appointment was set up with mothers/caregivers who expressed willingness to participate to meet at the clinic or at a place convenient and private to the individual. Data collectors obtained written consent and facilitated the questionnaire with the caregivers in siSwati or English, depending on the participant’s language preference. The questionnaire focused on socio-demographic characteristics (age of caregiver, religion, number of children, etc.), access to health care facilities and health care seeking behaviors (access to clinic, limitations of access, facility attendance, immunization, etc.), caregiver health (substance use, HIV status, ART adherence), child HIV status and ART enrollment (counselling on child’s HIV status, reasons for not enrolling), and interpersonal factors (availability of support groups, relationship with caregiver). All caregivers were given transport reimbursement after the

interview. The flow chart below shows the attempts made to recruitment participants and the final number of cases and controls providing data for analysis.

Data Analysis

The data were analyzed using SAS 9.4 and the level of significance for all tests was kept as 0.05. The participants were divided according to initiation/non-initiation status on ART. Chi-square and when applicable Fisher's exact tests were performed between ART initiation status and categorical variables. Variables with a p value less than 0.1, and important socio-demographic variables, were used to calculate odds ratios using crude logistic regression comparing ART initiation/non-initiation. Variables with a p value less than 0.1 that caused convergence in the model due to small numbers (such as alcohol use and sexual abuse) were removed from the model. Because immunization uptake differences was significant at 6, 9, 12 and 18 months, immunization status was dichotomized into having had immunizations after 6 months, or no longer returned for immunizations, in order to represent the significant drop in immunizations among cases and controls. The same variables from the crude logistic regression analysis were used in a multivariable regression analysis adjusted for region living, marital status, religion, number of children living in household, current employment status, frequency of child's visit to clinic, distance to nearest clinic, immunization status relationship with healthcare provider, caregivers' frequency of healthcare attendance, appointment consistency, medication adherence and caregivers' HIV status.

Results

Sociodemographic characteristics of caregivers of cases and controls

Two hundred and thirty-eight caregivers (40 for cases and 198 for controls) participated in the study; 15 were males and 223 were females (Table 1). Most participants were from Manzini (37.4%). A significant difference was observed for number of children living in the household for mothers/caregivers of cases and controls ($p=0.01$). Approximately 3.1% of control caregivers had no children living in their household compared to 15% of caregivers of cases, and approximately 76.0% of caregivers of controls had 1-4 children compared to 65.0 % of caregivers of cases. Approximately 96% of caregivers of controls had a child 0-2 years or 3-5 years old compared to 77% of caregivers of cases ($p<0.001$). Caregivers of cases and controls did not differ in a number of sociodemographic or economic factors.

Caregiver relationship to the child, child's clinic attendance, importance of ART enrollment and side-effects of ART on child

The majority of caregivers were the biological mother or father (92.0% for cases and 85.0% for controls; Table 2). Although 42.5% of caregivers of cases and 55.1% of caregivers of controls reported taking the child to the clinic every month, a significantly higher percent of caregivers of cases than controls (50.0% vs 17.9%) reported never taking the child to the clinic or taking the child once in every three months or more ($p<0.001$; Table 2). A significantly higher proportion of caregivers of controls (99.5%) than cases (87.0%) agreed or strongly agreed that it is important to enroll HIV-positive infants on ART ($p<0.001$). When asked about the importance of enrolling a child on ART, a significantly higher proportion of controls compared to cases (99.5% vs 86.8%; $p<0.001$) agreed that it is

important to enroll children living with HIV on ART (Table 3). The top three reasons given by caregivers for not initiating the children on ART were: they did not understand the process of ART enrollment (15.0%); the child was not sick (12.5%); and they feared disclosure of the child's HIV status (10.0%; data not shown). Only 6% reported that they had to get permission from their partner before initiating the child on ART; 50% reported that they were not able to initiate their child on ART either because the child died before initiating ART (31%) or that the child was not eligible for ART because he/she had just been initiated on TB treatment (19%). Among controls, only 16% indicated that their child experienced side effects from ART.

Caregivers' attendance at a healthcare facility, consistency in keeping appointments and taking medication, distance to nearest clinic and relationship with healthcare provider

A significantly higher proportion of caregivers of cases versus controls (35.0% vs 18.9%) reported never attending a health facility or attending once in greater than 3 months ($p=0.02$; Table 3). A higher proportion of caregivers of controls (87.2%) reported keeping appointments consistently compared to caregivers of cases (65.0% ; $p<0.001$), and 90.2% of caregivers of controls reported always taking medicine as prescribed compared with 71.8% of caregivers of cases ($p<0.001$; Table 3). Although only marginally significant, it is interesting to note that 47.5% of cases versus 31.0% of controls reported that their nearest clinic was <30 minutes from their homes ($p=0.07$; Table 3). A higher percent of controls (69.0%) lived further than 30 minutes (31 to >60 mins) from the nearest clinic compared with cases (52.5%). A significantly higher proportion of caregivers of controls versus cases (94% vs 83%) reported that they had good/excellent relationship with their healthcare provider ($p<0.001$).

Caregivers' report on HIV status, CD4 count and ART enrollment

Although the majority of parents/caregivers in both groups reported knowing their HIV status, a significantly higher proportion of caregivers of controls reported knowing their HIV status compared to caregivers of cases (99.0% vs 93.0%; $p=0.03$; Table 3). Approximately 89% caregivers of cases and 87% of caregivers of controls reported their HIV status; a significantly higher percent of caregivers of cases than controls preferred not to answer this question (5.4% vs 1.5%; $p=0.04$). Of caregivers who reported a CD4 count, 54% of caregivers of controls and 33% of caregivers of cases had a CD4 count ≥ 500 cells/mm³. However, only 60% of caregivers of controls and 43% of caregivers of cases reported current enrollment on ART. Most participants on ART (94% caregivers of controls and 88% of caregivers of cases) reported always taking their ART medicine (Table 3).

HIV disclosure, support network, substance use and antenatal care

With regard to disclosure of HIV status, 81.0% of caregivers of controls and 75.0% of caregivers of cases reported that they had disclosed their HIV status. About 11.0% of caregivers of cases and 12.0% of caregivers of controls reported that they had experienced HIV-related stigma (Table 3). Only 12.5% of caregivers of cases versus 21.2% of caregivers of controls reported that support groups were available; the majority of caregivers of cases (65%) said that support groups were not available and 22.5% did not know if support groups were available (Table 3). Alcohol use and smoking was not different among caregivers of

cases and controls. However, 5.0% of caregivers of cases and no control caregiver reported use of addictive substances ($p<0.001$; Table 3). Alcohol use during pregnancy was marginally significantly different between caregivers of cases and controls (11.0% vs 3.0%, respectively; $p=0.05$).

Clinic Visits for Immunization

In Swaziland, infants receive immunizations at birth, 6, 10 and 14 weeks and 6, 9, 12 and 18 months. Uptake of immunization was similar for cases and controls until at 6 months when there was a significant drop in uptake of immunization by cases that continued up to 18 months ($p<0.001$; Table 3). Over 50% of infant cases reported not returning for their 9, 12 and 18 month immunizations when compared to only an 11.6% loss among controls ($p<0.001$; Table 3).

Logistic regression analyses

The unadjusted logistic model (Table 4) showed that children living in Manzini were 2.9 times more likely to have initiated ART than children living in Hhohho (OR 2.89, 95% CI = 1.13-7.39). Children who were taken to the clinic every month, or every 2 months, by caregivers, were 3.63 and 10.10 times more likely to initiate ART (OR 3.63, 95% CI 1.71-7.69 and OR 10.10, 95% CI 2.79–36.54, respectively) compared to children who were taken to the clinic less often. Children who lived within 30 minutes of the nearest clinic were 65 percent less likely to initiate ART than those who live more than 60 minutes away (OR 0.35, 95% CI 0.14-0.89). Children who received any immunization after 6 months were 8.4 times more likely to initiate ART than children who did not (OR 8.41, 95% CI 3.94 – 17.94). Children of caregivers who reported having excellent or good relationship with healthcare providers were 3.6 times more likely to initiate ART than those of caregivers who reported average or poor relationship with healthcare providers (OR 3.61, 95% CI 1.30-9.97). Caregivers who reported attending a healthcare facility once in less than or equal to 3 months were 2.33 more likely to initiate their infants on ART than those who attend once in more than 3 months or never (OR 2.33, 95% CI 1.11-4.89). The likelihood of ART initiation among infants whose caregivers reported always attending their clinic appointments was 3.68 times higher (OR 3.68, 95% CI 1.70-7.98) when compared with infants of caregivers who reported that they were sometimes, rarely or never consistent in keeping clinic appointments. Caregivers of children who reported always taking their medication as prescribed were 3.44 times more likely to initiate their infants on ART (OR 3.44, 95% CI 1.49-7.94) than those who reported rarely, sometimes or never taking their medication as prescribed.

The final adjusted multivariable logistic model showed that infants who were taken to the clinic every month, or every 2 months were 5.78 and 6.20 times more likely to initiate ART compared to those who were taken to the clinic less often (OR 5.78, 95% CI 1.82-18.33 and OR 6.20, 95% CI 1.30–29.60, respectively). Children who lived 30 minutes and 31-60 minutes from the nearest clinic were 84% and 79% less likely, respectively to initiate ART (OR 0.16, 95% CI 0.03-0.78 and OR 0.21, 95% CI 0.04-0.98) compared with those who lived >60 minutes from the nearest clinic. Children who received any immunization after 6 months of age were 22.59 times more likely to initiate ART (OR 22.59, 95% CI 7.00-21.72)

than those who did not. Infants whose caregivers reported having excellent or good relationship with their healthcare provider were 4.32 times more likely to be initiated on ART (OR 4.32, 95% CI 1.01-18.59) than infants whose caregivers reported average, poor or very poor relationship with their healthcare providers.

Discussion

The multivariable logistic regression showed that children of caregivers who take their infants to the clinic every month or every 2 months, were 6 times more likely to initiate ART compared to children whose caretakers took them to the clinic less frequently. A study conducted in South Africa reported that help from the clinic in providing transportation, and support from family and day-care centers/orphanages, facilitated uptake of HIV care and treatment among children (Yeap et al., 2010). In our study the majority of cases and controls said that they did not have additional support and over 50% said that support groups were either not available or that they did not know if support groups were available. If support groups are available this is not being communicated to participants. If support groups are not available, this may be one area that could be developed to assist parents of newly diagnosed HIV-positive children to initiate care and treatment.

The unadjusted analysis also showed that caregivers who attended a healthcare facility once in less than 3 months were 2.33 times more likely to initiate their infants on ART compared to those who attended less frequently. The unadjusted model found that the likelihood of infants being initiated on ART among caregivers who always attend their appointments or take their medication as prescribed is more than three times higher when compared with those who are sometimes/rarely consistent in attendance or in taking their medication. This indicates a pattern of behavior among cases with regard to inconsistent clinic attendance and compliance with medication that is different from controls.

With regard to distance to the nearest clinic, we found that participants who lived 30 or 31-60 minutes of the nearest clinic were 84% and 79% less likely, respectively, to initiate their infants on ART compared to those who lived >60 minutes from a clinic. Oftentimes HIV-positive people prefer to travel to distant clinics outside of their home community to avoid being seen by people who know them and to keep their HIV-positive status private. A study conducted in Kenya on factors underlying HIV care of infected and exposed children reported that disclosure of HIV status for both mother and child was an important factor in the women's decision to take their children for HIV care (Wachira, Middlestadt, Vreeman, & Braitstein, 2012). HIV related stigma is a major problem in Swaziland and is a key reason for low uptake of HIV testing and counseling or disclosure of HIV-positive status in the country (National Emergency Response Council on HIV and AIDS, 2014). A study conducted in 2012 found that nearly 45% of Swazis who know their HIV-positive status refuse to go to clinics for ART for fear of being identified as being infected.

The adjusted logistic regression model showed that relationship with health care provider is an important factor infant initiation on ART. Participants who reported good or excellent relationship with their healthcare provider were 4.32 times more likely to initiate ART than those who reported average or poor relationship. The study conducted in South Africa by

Yeap et al. reported that negative staff attitudes such as unapproachability, rudeness and patient blaming were barriers to uptake of HIV care and treatment among children (Yeap et al., 2010). Therefore, addressing these matters and training staff to be supportive, welcoming and respectful may improve uptake of infant HIV care and treatment.

In Swaziland infants receive immunizations at birth, 6, 10 and 14 weeks and at 6, 9, 12 and 18 months. In this study, there was good immunization uptake for both cases and controls for the first 3 immunization time points with a significant drop off in uptake by cases after 6 months. It may be that by this time cases were dying possibly from lack of ART initiation. Since infants are routinely brought to immunization visits up to 14 weeks, if healthcare workers check on the HIV status of the infant at each of these visits, this could allow early initiation of ART and linkage to HIV care. If these visits are being carried out without follow-up of HIV test results, this is a missed opportunity to identify and follow the infants when their results come back HIV-positive. However, mothers may not take their children to the same health facility for immunizations, which may prevent the follow up on the test results. For example, it is difficult to link mothers to the HIV results if they delivered and tested their child for HIV in one of the larger hospitals, but attend small local clinics for follow-up and immunizations. Furthermore, if the main caregiver does not take the child for immunization, healthcare workers may not be able to follow up on the positive HIV test result.

Limitations

The study has certain limitations which should be considered when interpreting the results. Only a sub-set of facilities in the country were sampled so the findings are not generalizable to the entire population of children, especially to children from smaller health facilities that were not sampled. However, since health facilities were selected to represent a mix of facility types, regions, and demographic settings in Swaziland, the findings are still expected to be generalizable to a significant proportion of the population of HIV-positive children <2 years. Recall bias may be present in this study and responses may also have been influenced by social desirability bias and by participants' fear of HIV-related stigma. Missing or incorrect contact information at some locations may have caused selection bias since only mother/caregivers of cases with correct contact information could be invited to participate.

Conclusions

Regardless of the limitations, the study identifies frequency with which the child is taken to the clinic, distance to the nearest clinic, immunization uptake, and relationship with healthcare providers as significant predictors of ART initiation among HIV-positive children in Swaziland. These factors should be regarded as priority areas for intervention among HIV-positive women, especially HIV-positive pregnant women, attending clinics in Swaziland.

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Figure 1.
Flow chart of participant recruitment

Table 1.

Caregiver sociodemographic factors associated with child antiretroviral therapy (ART) initiation (N=238)

Child Initiated on ART					
	No		Yes		P-value
	N=40	%	N=198	%	
Sex of caregiver					0.28
Female	39	97.5	184	92.9	
Male	1	2.5	14	7.0	
Region living now					0.10
Hhohho	14	35.0	49	24.7	
Manzini	8	20.0	81	40.9	
Lubombo	13	32.5	47	23.7	
Shiselweni	5	12.5	21	10.6	
Marital status					0.93
Single/ Divorced/ Widowed	21	53.8	107	54.6	
Married/Cohabitating	18	46.2	89	45.4	
Highest level of education					0.54
Primary/Not attended school	13	32.5	83	41.9	
Secondary/ Vocational	14	35.0	59	29.8	
High School or higher	13	32.5	56	28.3	
Current employment status					0.20
Employed/ Self- employed	17	42.5	106	53.5	
Unemployed	23	57.5	92	46.5	
Monthly income					0.71
<E500	3	20.0	14	13.2	
E500-1200	8	53.3	55	51.9	
>E1200	4	26.7	37	34.9	
Source of income					0.32
Partner	12	54.5	60	60.6	
Family	7	31.8	18	18.2	
Other/ Church/ Grants	3	13.6	21	21.2	
Religion					0.39
Christian	25	64.1	110	56.7	
Others	14	35.9	84	43.3	
Number of people living in household					0.29
4 people	20	50.0	81	40.9	
>4 people	20	50.0	117	59.1	
Number of children living in household					0.01
0 children	6	15.0	6	3.1	
1-4 children	26	65.0	150	76.0	
>4 children	8	20.0	40	20.4	
Children in household by age category					<0.001

Child Initiated on ART					
	No		Yes		P-value
	N=40	%	N=198	%	
0-2 years	18	51.4	116	60.4	
3-5 years	9	25.7	69	35.9	
6-10 years	5	14.3	6	3.1	
11-17 years	3	8.6	1	0.5	
Living situation					0.68
Own Home	15	40.5	87	46.0	
Rent	13	35.1	53	28.0	
Live with family/friends' houses	9	24.3	49	25.9	
Main material of home					0.40
Cement	32	82.1	150	75.8	
Other	7	17.9	48	24.2	
Energy source used for cooking					0.28
Gas/ Electricity	19	47.5	76	38.4	
Other	21	52.5	122	61.6	
Principal sanitary system					0.66
Flushing Toilet	3	7.5	19	9.7	
Pit Latrine/ Others	37	92.5	176	90.3	
Principal garbage disposal					0.52
Municipal	4	10.0	14	7.1	
Burial/ Burning/Others	36	90.0	184	92.9	

* P-values were calculated using chi-square and fisher's exact test for the categorical variables

Bold = statistically significant at $p < 0.05$

Numbers may not always add up to total numbers due to missing responses

Table 2.

Caregiver relationship, child's clinic attendance, importance of ART enrollment, and side effects of antiretroviral therapy (ART) among children initiated/not-initiated on ART

Child initiated on ART					
	No		Yes		P-value
	N	%	N	%	
Relationship to child					0.22
Biological Mother/Father	36	92.3	162	84.8	
Grandparents/Relatives/Others	3	7.7	29	15.2	
How often child is taken to clinic					< 0.001
Every Month	17	42.5	108	55.1	
Every Two Months	3	7.5	53	27.0	
Once Every 3 months or more/Never	20	50.0	35	17.9	
Time was spent explaining child's HIV results					0.14
<10 minutes/None/Don't know	2	5.1	19	9.6	
10-20 minutes	10	25.6	24	12.2	
21-30 minutes	10	25.6	67	34.0	
>30 minutes	17	43.6	87	44.2	
Important to enroll HIV-positive infants on ART					<0.001
Strongly agree/Agree	33	86.8	195	99.5	
Neutral	3	7.9	1	0.5	
Strongly disagree/Disagree	2	5.3	0	0.0	
Child's ART side effects					
No	-	-	168	84.9	
Yes	-	-	29	14.7	
Other children on ART					0.35
Care for no other children	3	7.5	6	3.0	
<3	36	90.0	183	92.4	
3	1	2.5	9	4.5	
Additional support					0.91
No	36	90.0	177	89.4	
Yes	4	10.0	21	10.6	

* P-values were calculated using chi-square and fisher's exact test for the categorical variables

Bold = statistically significant at $p < 0.05$

Numbers may not always add up to total numbers due to missing responses

Table 3.

Caregiver factors that possibly act as barriers /facilitations to initiation on antiretroviral therapy (ART)

Child initiated on ART				
	No		Yes	
	N	%	N	%
Caregiver's attendance at a health care facility				0.02
Once in less than 3 months	26	65.0	160	81.2
Once in more than 3 months/Never	14	35.0	37	18.9
Caregiver's appointment consistency				< 0.001
Always	26	65.0	171	87.2
Sometimes/Rarely/Never	14	35.0	25	12.8
Caregiver's take medicine as prescribed				<0.001
Rarely / Sometimes	6	15.4	15	7.2
Always	28	71.8	175	90.2
Not taking any medications	5	12.8	5	2.6
Nearest clinic				0.07
30 minutes	19	47.5	67	30.8
31-60 minutes	14	35.0	73	36.9
> 60 minutes	7	17.5	64	32.3
Mode of transportation				0.30
Personal Car	1	2.5	5	2.5
Public Transportation	26	65.0	151	76
Other/ Walk	13	32.5	42	21.5
Caregiver's relationship with healthcare provider				<0.001
Excellent / Good	33	82.5	187	94.4
Average	3	7.5	11	5.6
Poor / Very Poor	4	10.0	0	0.0
HIV status known				0.03
No	2	5.0	1	0.5
Yes	37	92.5	196	99.0
Prefer not to answer	1	2.5	1	0.5
HIV status reported				0.04
HIV+	33	89.2	171	87.2
HIV-	2	5.4	22	11.2
Prefer not to answer	3	5.4	2	1.5
CD4 count				0.17
Less than 350 cells/mm3	5	15.2	19	11.2
350-499 cells/mm3	13	39.4	50	29.4
More than 500 cells/mm3	11	33.3	91	53.5
Unknown	4	12.1	10	5.9
Currently on ART				0.12
No	23	57.5	79	40.1

Child initiated on ART					
	No		Yes		P-value
	N	%	N	%	
Yes	17	42.5	118	59.9	
ART consistency					0.30
Sometimes	0	0.0	2	1.8	
Almost Always	2	12.5	5	4.6	
Always	14	87.5	102	93.6	
Disclosure of HIV status					0.65
No	10	25.0	38	19.3	
Yes	30	75.0	159	80.7	
Family unaccepting of HIV					0.41
No	38	95.0	175	90.2	
Yes	2	5.0	19	9.8	
Experienced HIV stigma					0.19
No	34	89.5	172	87.7	
Yes	4	10.5	24	12.2	
Alcohol use					0.12
No	32	80.0	176	88.9	
Yes	8	20.0	22	11.1	
Smoking					0.37
No	37	92.5	191	97.0	
Yes	3	7.5	6	3.0	
Use addictive substances					<0.001
No	38	95.0	198	100	
Yes	2	5.0	0	0.0	
Alcohol use during pregnancy					0.05
No	31	88.6	144	96.6	
Yes	4	11.4	5	3.4	
Antenatal care visits					0.45
4 times	16	45.7	77	52.7	
>4 times	19	54.3	69	47.3	
Trimester when accessed antenatal care					0.66
First Trimester	9	25.7	42	28.4	
Second Trimester	17	48.6	81	54.7	
Third Trimester	8	22.9	21	14.2	
Other/Don't Know	1	2.9	4	2.7	
Took ART during pregnancy					0.18
No	14	41.2	80	54.1	
Yes	20	58.8	68	45.9	
Immunization of child					
6 weeks	39	97.5	193	97.5	0.99
10 weeks	39	97.5	191	96.5	0.74

Child initiated on ART

	No		Yes		P-value
	N	%	N	%	
14 weeks	36	90.0	189	95.5	0.27
6 months	33	82.5	190	96.0	<0.001
9 months	27	67.5	186	94.0	<0.001
12 months	23	57.5	183	92.4	<0.001
18 months	19	47.5	178	90.0	<0.001
Child having any immunization after 6 months					<0.001
Yes	19	47.5	175	88.4	
No	21	52.5	23	11.6	

* P-values were calculated using chi-square and fisher's exact test for the categorical variables

Bold = statistically significant at $p < 0.05$

Numbers may not always add up to total numbers due to missing responses

Table 4.

Multivariable association between socio-demographic factors, healthcare seeking behaviors, HIV status and antiretroviral therapy (ART) uptake by caregivers and ART initiation of infants (odds enrolled vs not enrolled)

	Crude Odds Ratio Estimates (95% confidence intervals)	Adjusted Odds ratios (95% confidence intervals)
How often child is taken to clinic		
Every month	3.63 (1.71-7.69)	5.78 (1.82-18.33)
Every two months	10.10 (2.79-36.54)	6.20 (1.30-29.60)
Once every 3 months or more/Never/Only when sick	Ref	Ref
Nearest clinic		
30 minutes	0.35 (0.14-0.89)	0.16 (0.03-0.78)
31-60 minutes	0.57 (0.22-1.50)	0.21 (0.04-0.98)
>60 minutes	Ref	Ref
Child having any immunization after 6 months		
Yes	8.41 (3.94-17.94)	22.59 (7.00-21.72)
No	Ref	Ref
Caregiver's relationship with healthcare provider		
Excellent / Good	3.61 (1.30-9.97)	4.32 (1.01-18.59)
Average/Poor/Very Poor	Ref	Ref
Caregiver's attendance at a health care facility		
Once in less or equal to 3 months	2.33 (1.11-4.89)	1.73 (0.53-5.61)
Once in more than 3 months/Never	Ref	Ref
Caregiver's appointment consistency		
Always	3.68 (1.70-7.98)	1.91 (0.48-7.53)
Never/Rarely/Sometimes	Ref	Ref
Caregivers take medicine as prescribed		
Always	3.44 (1.49-7.94)	2.00 (0.53-7.59)
Rarely/Sometimes/Never	Ref	Ref
Region living now		
Hhohho	Ref	Ref
Manzini	2.89 (1.13-7.39)	2.32 (0.61-8.80)
Lubombo	1.03 (0.44-2.43)	0.34 (0.08-1.47)
Shiselweni	1.20 (0.38-3.76)	2.22 (0.31-15.74)
Marital status		
Single/ Divorced/ Widowed	1.03 (0.52-2.05)	0.87 (0.30-2.5)
Married/Cohabiting	Ref	Ref
Religion		
Christian	Ref	Ref
Others	1.36 (0.67-2.78)	0.95 (0.31-2.87)
Number of children living in household		
4 children	0.97 (0.42-2.28)	0.79 (0.22-2.82)
>4 children	Ref	Ref
Current employment status		

	Crude Odds Ratio Estimates (95% confidence intervals)	Adjusted Odds ratios (95% confidence intervals)
Employed/Self-employed	1.56 (0.78-3.10)	1.98 (0.73-5.34)
Unemployed	Ref	Ref
HIV status of caregiver		
HIV+	Ref	Ref
HIV–	2.12 (0.48-9.46)	2.86 (0.38-21.72)

* Adjusted model contains all variables listed in the table

Ref – referent group

Bold = statistically significant at $p < 0.05$